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We are thus assured of an African fauna of surpassing richness, not a tithe of which has yet been revealed.—O. F. COOK.

**Entomological News.**—Prof. Clarence M. Weed of the New Hampshire College spent several weeks in December and January, studying the Bermuda Islands. Many species not before recorded from there were collected.

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## EMBRYOLOGY.<sup>1</sup>

**The Sense Plates, the Germ of the Foot, and the Shell or Mantle Region in the Stylomatophora.**<sup>2</sup>—To our knowledge of these subjects, Dr. Ferdinand Schmidt contributes the results of his numerous observations upon the embryos of *Succinea*, *Limax* and *Clausilia*. Concerning the sensory plates he shows that immediately behind the budlike rudiments of the future egg-bearing and the simple tactile tentacles, in *Limax* where the development is most easily followed, there arises a third pair of buds like the first two pairs in all respects except in size. From these buds arises the so called oral lobes, subtentacular lobes, or labial tentacles. They have no relation to the velum whatever, since they arise in a pre-velar region. This is completely at variance with the observations of Jayeux-Laffuie on *Onchidium* and those of Ray Lankester on *Limnaeus* in which the subtentacular lobes are asserted to arise from the velum or a rudiment of the same. Should further studies upon these forms substantiate the assertion, we would then have two groups of oral lobes, one in which they arise from the velum and to be homologized with the oral lobes of the lammellibranchiata, where they undoubtedly have such an origin, and the other in which they arise from the sensory plates and are homologous with the tentacles.

In his account of the development of the foot in *Succinea* he supports the conclusion long since put forth by Lankester, namely, that the typical form of the blastopore is an elongated cleft on the ventral side of the embryo, from which arises in some cases the mouth, in others the anus, according as the cleft persists anteriorly or posteriorly. This form of a blastopore is certainly important, considering his con-

<sup>1</sup> Edited by E. A. Andrews, Baltimore, Md., to whom abstracts reviews and preliminary notes may be sent.

<sup>2</sup> Beiträge zur Kenntniss der Entwicklungsgeschichte der Stylomatophoren, with 9 text figs. Zool. Jahrbücher, VIII, 318.

clusions with regard to the foot. This, he says, is to be distinguished very much earlier than has hitherto been recorded and, as one would naturally expect from Patten's study of *Patella*, which he quotes, it arises from a pair of folds and not from a single one as has generally been stated for related forms. In *Succinea* these two folds appear close behind the blastopore between the region of the mouth and anus, and approaching one another fuse in the median line forming an oval area. A median furrow persists for some time as evidence of the union as in *Patella*. This last fact gives some meaning to the similarly furrowed appearance occurring in *Limnæus*, *Planorbis* and *Ancylus*.

A study of over 100 embryo showed him that this paired origin is the rule, although examples were found where the elevation was unpaired, forming then a broad disc. In one apparently pathological case the blastopore had retained its supposed primitive elongated form and the beginning of the foot had the form of a horseshoe embracing its hinder end.

His conclusion that the foot represents the fused lips of the elongated blastopore removes the possibility of the organ being some kind of secondary formation, and makes it out to be a metamorphosed very ancient structure: and if the conclusion is correct, the molluscan foot is not quite such an anomalous structure as it has hitherto seemed.

A few remarks concerning the podocyst and the so called "Nackenblase" are of interest in that they show that the latter structure is not an organ at all, and that the contracting motions that have been observed in it are due to the contractions of the podocyst which acts as an organ of circulation. For in *Succinea* where the structure in question has an enormous development and where no podocyst occurs there are no such movements to be seen. The structure is, he says, a mass of endoderm cells swollen with albumen, the embryonal liver and the outer body epithelium.

With regard to the shell gland, Schmidt substantiates, in the main, the early observations of Gegenbaur or *Clausilia* and shows Korschelt's doubt concerning them to be unfounded. A large series of *Clausilia* embryos gave ample opportunities for study, and as a result it appears that very early the shell gland arises as an invagination of the outer epithelium, and closing up, becomes completely cut off from its parent layer. Sections show it to be completely surrounded by mesoderm. The hollow vesicle thus formed becomes flattened out so that he distinguishes in it an outer and an inner layer of cells separated by a narrow space. The outer layer remains more or less un-

changed, but the cells of the inner one proliferate and begin to lay down the shell, which may be distinguished in sections as a very thin lamina. At about this time observations of embryos by reflected light show a small invagination or hole near the center of the newly formed shell, which is thus laid bare. The hole then is of secondary formation and not, as Korschelt supposes, something that has persisted from the original invagination.

It appears then that the internal formation of the shell, as it has been generally recognized in the so called naked pulmonates is not an exception to a rule but the rule itself, and that the condition obtaining in *Limax* and others differs from that in the rest of the pulmonates only in so far as a rudimentary condition is retained in the adult animal.—F. C. KENYON, Ph. D., Clark University, Worcester, Mass.

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## PSYCHOLOGY.

**Physical and Social Heredity.**—The great courtesy of the Editor of this journal in reprinting one of my paper from *Science* preliminary to replying to it encourages me to ask him for a page or two of comment on his reply. This is the more needful since the second of my papers which he criticises may not have been seen by the readers of the *NATURALIST*, and the third has only just appeared in *Science*, (March 20 and April 10, 1896).

The main question at issue is the relation of consciousness or intelligence to heredity; the other matter, that of the relation of consciousness to the brain, being so purely speculative that I shall merely touch upon it at the end of this note.

Prof. Cope<sup>1</sup> says: "there is no way short of supernatural revelation by which mental education can be accomplished other than by contact with the environment through sense-impressions, and by transmission of the results to subsequent generations. The injection of consciousness into the process does not alter the case, but adds a factor which necessitates the progressive character of evolution." Both of these sentences I fully accept, except that the word "transmission" seem to imply the Lamarckian factor, which I think the presence of consciousness renders unnecessary. Using the more neutral word "conservation" instead of "transmission," I may refer to three points on which Prof. Cope criticises my views: first, conservation of intelligent acquisitions from genera-

<sup>1</sup> AMER. NAT., April, 1896, p. 343.